

1 PRESSURIZING SYSTEM FOR A DISPENSING CONTAINER
2

3 BACKGROUND OF THE INVENTION
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5 1. Field of the Invention

6 This invention relates broadly to systems for
7 pressurizing pressurized dispensers. More particularly,
8 this invention relates to filling valves for the dispensers
9 and cooperating elements on the dispenser and a
10 pressurizing station.
11

12 2. State of the Art

13 Pressurized aerosol containers are popular to dispense
14 cooking oils, grooming products such as hairspray and
15 deodorant, insect repellants, etc. In most cases,
16 regardless of what the containers dispense, they are
17 pressurized at the point of filling by the addition of some
18 sort of propellant gas. The containers are single-use
19 items that are not reusable or even easily recyclable.
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21 One approach to solving these problems is that
22 provided by the popular MISTO® aerosol sprayers marketed by
23 the assignee of the present invention. This container is
24 an operationally pressurizable container having a built in

1 pressure valve that can be refilled. Air is pumped into
2 the unit by a pump which is an integral part of the
3 container. While such a unit has many virtues, it does
4 require the user to expend time and energy repressurizing
5 the container, a fact that becomes significant in
6 situations of either heavy use of the dispensing unit or
7 for end users for who either the time factor or the
8 required physical effort are concerns.

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10 U.S. Pat. Nos. 5,623,974 to Losenno et al., 5,462,099
11 to Demarest et al., and 5,343,904 to Kaeser disclose
12 refillable aerosol containers which are couplable to a
13 separate compressor for pressurization. In Kaeser, a
14 complex locking mechanism is provided to lock the container
15 to the compressor during refill to prevent the container
16 from blowing off a refill needle during pressurization. In
17 Losenno et al. and Demarest et al. no such locking
18 mechanism is provided, and the user must apply manual force
19 to the container during pressurization to prevent the
20 container from blowing off the pressurization needle.
21 These designs, for whatever reason, have failed to either
22 reach the commercial market or be commercially successful.
23 It is believed that it is essential that any such
24 refillable pressurizable container system be extremely easy

1 to use and be capable of being refilled without user force
2 during pressurization.

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SUMMARY OF THE INVENTION

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It is therefore an object of the invention to provide
an aerosol container and a pressurization system therefor
which are very easy to use.

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It is another object of the invention to provide an
aerosol container and a pressurization system therefor
which does not require user force during pressurization.

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It is also an object of the invention to provide an
aerosol container and a pressurization system therefor in
which the container is automatically held relative to the
pressurization system during pressurization.

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It is a further object of the invention to provide
structural configurations for an aerosol container and a
pressurization system so that the container is forced into
an orientation in which a pressurization valve in the
container is perfectly mated with a pressurization needle
on the compressor component for pressurization.

1

2 In accord with these objects, which will be discussed
3 in detail below, a refillable aerosol container and a
4 pressurization station therefor are provided. The
5 container generally includes a fluid tight compartment
6 defined by a bottle and a screw cap, a filling valve at a
7 lower end of the bottle, and a spray nozzle coupled to the
8 cap. The pressurization station includes a housing
9 including a compressor and a power switch. The housing
10 further defines a collar defining a recess in which a
11 hollow pressurization needle is provided. The needle is in
12 fluid communication with the output of the compressor.

13

14 In accord with a first aspect of the invention, the
15 needle is provided with an enlarged generally frustoconical
16 head portion, a reduced diameter neck portion, and a
17 relative larger diameter base portion. The filling valve
18 of the container is a resilient duck-bill type valve. The
19 valve includes an upper split portion defining two
20 relatively flat "bills" that meet, a generally
21 frustoconical section expanding downward and terminating in
22 a barb, and a lower flared flange. The valve engages the
23 lower end of the bottle between the barb (which also
24 facilitates valve insertion) and the flared flange. The

1 valve includes an interior space having a first portion
2 sized to accommodate the head of the needle, a reduced
3 diameter neck portion, and a flared third portion providing
4 an entrance for the needle. The container may be
5 seated over the needle with relatively little user force.
6 When the container is fully seated on the needle and no
7 pressurizing force is present, the head of the needle
8 resides within the first portion of the interior space and
9 the neck of the needle resides in the narrower neck
10 portion, and the split valve remains closed. This prevents
11 any of the contents of the bottle from escaping. When the
12 compressor is operated, pressurizing fluid, e.g., air, is
13 forced into the valve and causes the bills of the valve to
14 flutter open to pressurize the container. Furthermore, as
15 the pressure within the container increases, the force
16 against the valve from the container contents increases.
17 As such, the force of the contents against the
18 frustoconical portion decreases the diameter of the neck
19 portion of the interior space, thereby capturing the head
20 portion of the needle within the valve and preventing the
21 container from blowing off the needle, even at maximum fill
22 pressure, e.g., 70 to 100 psi.

23

1 In accord with a second aspect of the invention, the
2 collar of the housing is sized and contoured to guide the
3 lower end of the container such that the needle enters the
4 fill valve in straight vertical alignment. This permits
5 very easy alignment between the needle and valve without
6 user concern for a misalignment, which could otherwise
7 cause valve puncture or wasted user time.

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9 Additional objects and advantages of the invention
10 will become apparent to those skilled in the art upon
11 reference to the detailed description taken in conjunction
12 with the provided figures.

13
14 BRIEF DESCRIPTION OF THE DRAWINGS

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16 Fig. 1 is a perspective view of a refillable aerosol
17 container docked to a pressurizing system therefor;

18
19 Fig. 2 is a longitudinal section of a lower end of the
20 container coupled over a needle of the pressurizing system,
21 wherein the container is provided with a first embodiment
22 of a valve;

23

1 Fig. 3 is a longitudinal section of a lower end of the
2 container coupled over the needle of the pressurizing
3 system, wherein the container is provided with a second
4 embodiment of the valve shown rotated 90° relative to the
5 valve in Fig. 2;

6
7 Fig. 4 is a perspective view of the pressurizing
8 system;

9
10 Figs. 5 through 7 are longitudinal section views
11 illustrating docking the container to the pressurization
12 system; and

13
14 Fig. 8 is a longitudinal section view similar to Fig.
15 7 but oriented 90° relative to the view of Fig. 7, showing
16 the valve in an open position when receiving a pressurizing
17 fluid from the needle.

18
19 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

20
21 Turning now to Figs. 1 and 2, a system 10 comprising a
22 refillable aerosol container 12 and a pressurization
23 station 14 therefor are shown. The container 12 generally
24 includes a fluid tight compartment defined by a bottle 16

1 and a screw cap 18 threadably engaged over an open end 20
2 of the bottle. The cap 18 is provided with an aerosol
3 spray nozzle 22 which is coupled to a tube 24 which extends
4 from the nozzle into a lower portion of the bottle 16. The
5 bottom 26 of the bottle 16 is preferably concave at its
6 exterior surface (and convex at its interior), and a
7 circular hole 28 is provided at the center of the bottom.

8
9 Referring to Fig. 2, a filling valve 30, generally of
10 the duck-bill variety, is provided in the hole 28. The
11 valve 30 includes an upper split portion 32 defining two
12 relatively flat "bills" 34, 36 that meet to provide a seal,
13 a generally frustoconical section 38 expanding downward and
14 terminating in a barb 40, a lower annular flared flange 42,
15 and an interior space 44. An annular groove 45 is defined
16 between the barb 40 and the flange 42.

17
18 According to a first embodiment of the invention, the
19 valve 30 is stabilized within the hole 28 with an annular
20 catch 46 which resides at the circumference of the hole 28
21 and a resilient annular strain relief member 48 which
22 engages the inner portion of the catch 46. More
23 particularly, the catch 46 includes ring groove 50, a barb
24 projection 56, inner rim 58, and a side wall 60. When the

1 catch 46 is positioned at the hole 28 from inside the
2 bottle 16, the side wall 60 fits against the circumference
3 of the hole 28 to position the catch 46 concentrically with
4 the hole 28. The ring groove 50 holds an o-ring 52 against
5 the interior surface 54 of the bottom 26 of the bottle 16
6 to provide a fluid tight seal thereat. The strain relief
7 member 48 includes an upper barb 62 and a groove 64. When
8 the strain relief member is pushed through the catch 46
9 from the bottom 26 of the bottle 16 (i.e., from outside the
10 bottle), the barb 62 seats over the inner rim 58 of the
11 catch 46, and the inner rim 58 is engaged within the groove
12 64. The valve 30 is then pushed through the lower end of
13 the strain relief member 48 such that the frustoconical
14 portion 38 resides within the bottle and the barb 40 passes
15 through and seats above the projections 56 of the catch
16 member 46. The catch member 46 and strain relief member 48
17 are positioned within and about the annular groove 45 in
18 the valve 30 (with the barb 40 of the valve seating above
19 members 46 and 48, and the flared flange 42 of the valve
20 seating below members 46 and 48). This locks the valve 30
21 relative to the bottom of the bottle 16 and provides a
22 fluid tight seal about the valve's periphery. Importantly,
23 where the hole 28 in the bottle 16 is a punched hole with
24 potentially sharp edges 66, the catch 46 and strain relief

1 48 operate to shield such sharp edges from contact with the
2 resilient valve 30, thereby preventing damage to the valve
3 that may otherwise occur.

4
5 Turning now to Fig. 3, a second embodiment of the
6 coupling between a valve 30a and the bottle 16 is shown.
7 In the second embodiment, the edge 66a about the hole 28a
8 in the bottom 26a of the bottle 16 may be bent inward
9 (i.e., upturned) to provide a rounded contour. In such an
10 embodiment, the rounded contour is unlikely to cause damage
11 to the valve 30a. Thus, the catch 46 and strain relief 48
12 (Fig. 2) are not as advantageous and may be eliminated. If
13 eliminated, the annular groove 45a about the valve 30a is
14 preferably reduced in width (the dimension between the barb
15 40a and the flange 42a) to correspond to the upturned
16 portion of the bottom 26a, while the other aspects of the
17 valve preferably substantially remain the same. The valve
18 30a is then pushed through the hole 28a such that the barb
19 40a of the valve 30a resiliently deforms, passes through
20 the hole, and then expands to capture the upturned edge 66a
21 within the annular groove 45a, between the barb 66a and the
22 flange 42a.

23

1 Turning back to Fig. 2, regardless of the manner in
2 which the valve 30 is coupled within the bottom of the
3 bottle, the interior space 44 of the valve 30 includes a
4 relatively large first portion 70, a reduced diameter neck
5 portion 72, and a flared third portion 74.

6
7 Referring now to Fig. 4, the pressurization station 14
8 includes a housing 80 having an external dock 82 for
9 receiving the lower end of the bottle 16 and a hollow
10 needle 84 at the center of the dock. The needle 84 is
11 coupled to a compressor 86 within the housing 80. The
12 housing 80 also includes appropriate switches to activate
13 the compressor, a power supply, and other essential
14 components, not shown, but which are well known in the art.
15 For example, U.S. Pat. Nos. 5,623,974 to Losenno et al.,
16 5,462,099 to Demarest et al., and 5,343,904 to Kaeser
17 disclose the essential elements within a docking station
18 and are hereby incorporated by reference herein in their
19 entireties.

20
21 Referring to Figs. 2 and 4, the needle 84 includes an
22 enlarged generally frustoconically tapering head portion
23 90, a reduced diameter neck portion 92, and a relative
24 larger diameter base portion 94. An axial throughbore 96

1 is defined therethrough. The interior space 44 of the
2 valve 30 accommodates the head 90 and neck portion 92 of
3 the needle 84, with the head 90 fitting diametrically
4 snugly within the first portion 70 of the space 44, and the
5 neck portion 92 of the needle 84 fitting diametrically
6 snugly within the neck portion 72 of the space and
7 extending within the flared third portion 74 of the space
8 44. The bills 34, 36 are located higher than the head 90
9 of the needle 84, such that even when the needle is fully
10 inserted into the valve 30, the valve remains closed.

11
12 Referring to Figs. 1, 5 and 6, the dock 82 of the
13 housing 14 is generally a collar sized and contoured to
14 guide the container 12 into an orientation in which the
15 valve is aligned with the pressurization needle 84 on the
16 pressurization station 14 (Fig. 6). The dock 82 has a
17 cylindrically tubular lower portion 98 (approximately 0.53
18 inch in height) having an inner diameter (e.g., 1.980
19 inches) which is just slightly larger (e.g., 0.010 inch
20 clearance) than the outer diameter at the lower end of the
21 container 12 (e.g., 1.970 inches), and an upper portion 100
22 with a surface 102 beveled outward relative to the inner
23 surface of the lower portion 98. The upper portion 100
24 bevels out to an inner diameter of, e.g., 2.060 inches;

1 i.e., preferably approximately 0.090 inch greater than the
2 lower end of the container. The dock 82 has a total height
3 of preferably approximately 0.780 inch, with the lower
4 portion 98 having a height of preferably approximately 0.53
5 inch, and the upper portion 100 having a height of
6 preferably approximately 0.25 inch. When a container 12 is
7 positioned at the dock, even at an angle, the beveled
8 surface 102 guides the lower end of the container 12 into
9 lower portion 98. Referring to Fig. 6, in this manner, the
10 interior space 44 of the valve 30 is automatically aligned
11 relative to the needle 84 without user concern for a
12 misalignment, which could otherwise cause valve puncture or
13 wasted user time with respect to alignment.

14
15 In use, during a first filling, the cap 18 is removed
16 from the bottle 16 and a selected liquid is poured through
17 the open end 20 of the bottle. The cap 18 is then threaded
18 back onto the bottle 16 until the bottle is closed. The
19 container 12 is then inserted into the dock 82 such that
20 the needle 84 is inserted into the valve 30 (Fig. 7). The
21 tapered end of the head 90 of the needle 84 and flared
22 opening 74 of the valve 30 facilitate the coupling between
23 the needle and valve such that the container and valve may
24 be coupled with relatively little user force.

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2 Referring to Figs. 2 and 7, when the container 12 is
3 fully seated in the dock 82 and fully seated on the needle
4 84 and no pressurizing force is present, the head 92 of the
5 needle 84 resides within the first portion 70 of the
6 interior space 44 and the neck 92 of the needle resides in
7 the narrower neck portion 72 of the space, and the split
8 valve 32 remains closed. This prevents any of the fluid
9 contents of the container 12 from escaping.

10

11 Referring to Figs. 1 and 8, when the compressor 86 of
12 the pressurization system 14 is operated, e.g., by
13 actuation of a switch (not shown), gas, e.g., air, under
14 pressure is forced through the needle 84 and into the valve
15 30. This causes the bills 34, 36 of the valve 30 to
16 flutter open such that the gas pressurizes the container
17 12. Furthermore, as the pressure within the container 12
18 increases, the force against the valve 30 from the
19 container contents increases. As such, the force of the
20 contents against the frustoconical portion 38 of the valve
21 30 decreases the diameter of the neck portion 72 of the
22 interior space 44. This captures the head portion 90 of
23 the needle 84 within the valve 30 and prevents the
24 container 12 from blowing off the needle 84, even at

1 maximum fill pressure, e.g., 70 to 100 psi. Preferably,
2 the pressurization station 14 includes means for
3 automatically deactivating the compressor 82 when a desired
4 fill pressure is reached. As soon as the compressor 86 is
5 turned off, the bills 34, 36 of the valve 30 close,
6 preventing any backflow of the contents through valve.

7
8 The container 12 is then removed from the
9 pressurization station 14. The spray nozzle 22 may then be
10 depressed to release an aerosolized form of the fluid
11 contents of the container 12. When the container 12 is
12 depressurized (either partly or completely), i.e., after
13 significant use or after removal and replacement of the cap
14 18 from the bottle 16, the container may be positioned
15 within the dock 82 of the pressurization station 14, and
16 re-pressurized as described above.

17
18 There have been described and illustrated herein
19 embodiments of a system including a refillable aerosol
20 container and a pressurization station. While particular
21 embodiments of the invention have been described, it is not
22 intended that the invention be limited thereto, as it is
23 intended that the invention be as broad in scope as the art
24 will allow and that the specification be read likewise.

1 Thus, while particular preferred dimensions for an
2 embodiment of the system have been disclosed, it is
3 recognized that other embodiments of greatly differing
4 dimensions may be provided. In addition, while the
5 dispensing container is disclosed as being a bottle, the
6 pressurizing station and valve may be used with other
7 dispensing containers, such as tubes, boxes, etc. Also,
8 while the preferred container is disclosed as dispensing an
9 aerosol, it is appreciated that the pressurizing station
10 may pressurize a container which is adapted to dispense any
11 material dispensable under pressure. Such dispensable
12 materials include, but are not limited to, fluids, gels,
13 pastes, and powders. It will therefore be appreciated by
14 those skilled in the art that yet other modifications could
15 be made to the provided invention without deviating from
16 its spirit and scope as claimed.